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# ECONOMIC GUIDELINES TO RANGE & PASTURE IMPROVEMENT IN ALBERTA

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# AN ECONOMIC GUIDE TO
# RANGE & PASTURE IMPROVEMENT
# IN ALBERTA

by

R.J. Miller

RESOURCE ECONOMICS BRANCH

ECONOMICS DIVISION, ALBERTA DEPARTMENT OF AGRICULTURE

in cooperation with

LANDS DIVISION, ALBERTA DEPARTMENT OF LANDS AND FORESTS

EDMONTON, ALBERTA

1971

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Minister of Agriculture

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# FOREWORD

The beef cow is the basic production unit of the whole beef industry. An expansion in consumer demand for beef products will induce some corresponding increase in the number of cows kept for production purposes. The increase will arise from a combination of increases in cow numbers within existing herds or the formation of new herds by operators who have decided to enter the beef business. The amount of the increase will depend on how favorable price expectations look in relation to anticipated costs and to other production alternatives. Traditionally, much of the feed required by the beef cow has been met by using her ability to harvest grass from lands which do not have more profitable alternative uses.

The Economics Branch of the Canada Department of Agriculture indicates that, in the long term outlook to 1986, there is a high probability for substantial increases in the demand for beef products.[1] The producers response to this demand will be in the form of more beef cows. This in turn will mean more land devoted to beef production and more intensive use of existing lands.

Alberta's land base devoted to grazing by cattle is approximately 22.1 million acres, of which, 11.6% is improved. Range improvement is one method farmers and ranchers may choose to adopt as a means of expanding their production. Their decision to do so, will depend on the way in which

---

[1] Yankowsky, Z., "The Intermediate and Long Term Market Outlook for Beef", Canadian Farm Economics, Volume 5, Number 3, August, 1970.

they view the economic returns from such an investment. Factors such as expected profit, risk, and land ownership will be included in such a decision.

In conjunction with the Lands Division of the Alberta Department of Lands and Forests, who administer some 4.8 million acres of leased public grazing land, this study was designed to investigate the economic feasibility of range and pasture improvement. As such, the results of this research are an input to government decisions on policies for range improvement. The information should be treated only as a guide for any individual farmer. Costs and returns are estimated averages, at one point in time, under specified assumptions. Each individual situation should be assessed on its own merits. The method developed is applicable.

G.B. Parlby

## ACKNOWLEDGEMENTS

The author wishes to acknowledge the contributions by numerous individuals who made this study possible. Firstly, the information provided by farmers and ranchers who responded to the mailed questionnaire was much appreciated. Mac Forbes of the Lands Division and Gerry Parlby of the Resource Economics Branch, provided valuable guidance throughout the study. Thanks are due to Mrs. Kay Kletke for her diligent work in summarizing and tabulating the data and to Miss Shelley Storrier in typing the report.

The results and conclusions are the responsibility of the author.

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# CHAPTER 1

# INTRODUCTION

## The Situation; Objectives of the Study

Alberta has some 22.1 million acres of grazing lands.[1] Of this total, only 2.3 million or 11.6% is classified as improved pasture. Consequently, improvement of native range and pasture lands by seeding more productive tame grass species offers some potential to cattle producers to increase their scale of operation without expanding their grazing land base.

However, previous research and communications have indicated that range improvement is not without risk; many factors need to be considered by the individual cattle producer. For example, alternative productive uses for limit financial resources are of primary importance. Uncertainty in establishing seeded pastures with the necessary productivity to recover improvement costs within a reasonable time period is another concern. One must recognize that costs of pasture improvement vary widely from one region of the province to another - depending upon the native cover, land characteristics, and the method of improvement used. Therefore, regions with higher improvement costs must yield proportionately greater responses in order to be equally feasible in economic terms.

With these conditions in mind, this study was designed to determine the economic feasibility of range and pasture improvement in various regions of Alberta under current livestock prices. The study was carried out in co-operation with the Lands Division of the Alberta Department of Lands and Forests who administer some 4.8 million acres of public grazing lands in the form of grazing leases. This land is held under lease by approximately 4600 lessees.

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[1] Dominion Bureau of Statistics, 1966 Census

## The Study Sample; Design and Procedures

A two page questionnaire was sent to a 20% sample of all Lands Division grazing lease holders as of September, 1970. The purpose of the questionnaire was to obtain basic economic data on beef production in the various regions of the province. Table 1 presents some basic statistics on the number of questionnaires mailed and the response rate.

TABLE 1

POPULATION, SAMPLE SIZE, RESPONSE RATE AND USEABLE SAMPLE

| | | |
|---|---|---|
| Total Number of Grazing Leases | | 4,646 |
| Sample Size | | 924 |
| No. of Questionnaires Returned | | 449 |
| % Returned | | 48.6% |
| No. of Questionnaires Useable | | 375 |
| No. of Questionnaires Not Useable* | | 74 |
| Effective Sample Size as % of Population | | 8.1% |
| Useable Questionnaires: | Prairie Region | 155 |
| | Parkland Region | 69 |
| | Grey Wooded Region | 111 |
| | Peace River (C.D. 15) Region | 40 |

* Consisted of questionnaires which, for various reasons, were returned either totally or largely incomplete and late returns.

A satisfactory response in terms of the quantity of questionnaires returned was obtained, 48.6%. The useable or effective sample amounted to 8.1% of the total number of lessees.

The bottom section of Table 1 outlines the number of useable questionnaires from the various regions of the province. These regions were established to reflect differences in the economics of beef production, costs of range improvement, and transportation costs. Figure 1 portrays these regions. The Prairie region consists of the Brown, Dark Brown and Thin Black soils south of township 33 (excluding the Special Areas) and is distinguished from the other regions largely because of climatic characteristics. The Parkland region consists of the northern prairie and the true parkland within the confines of the northern Dark Brown, Thin Black and Black soil zones. The Grey Wooded region consists of all the Grey Wooded soils outside of the Peace River region. Because of remoteness from a terminal market and different climatic characteristics, the Peace River region was defined as a separate area for analysis.

FIGURE 1

DEFINED GRAZING REGIONS

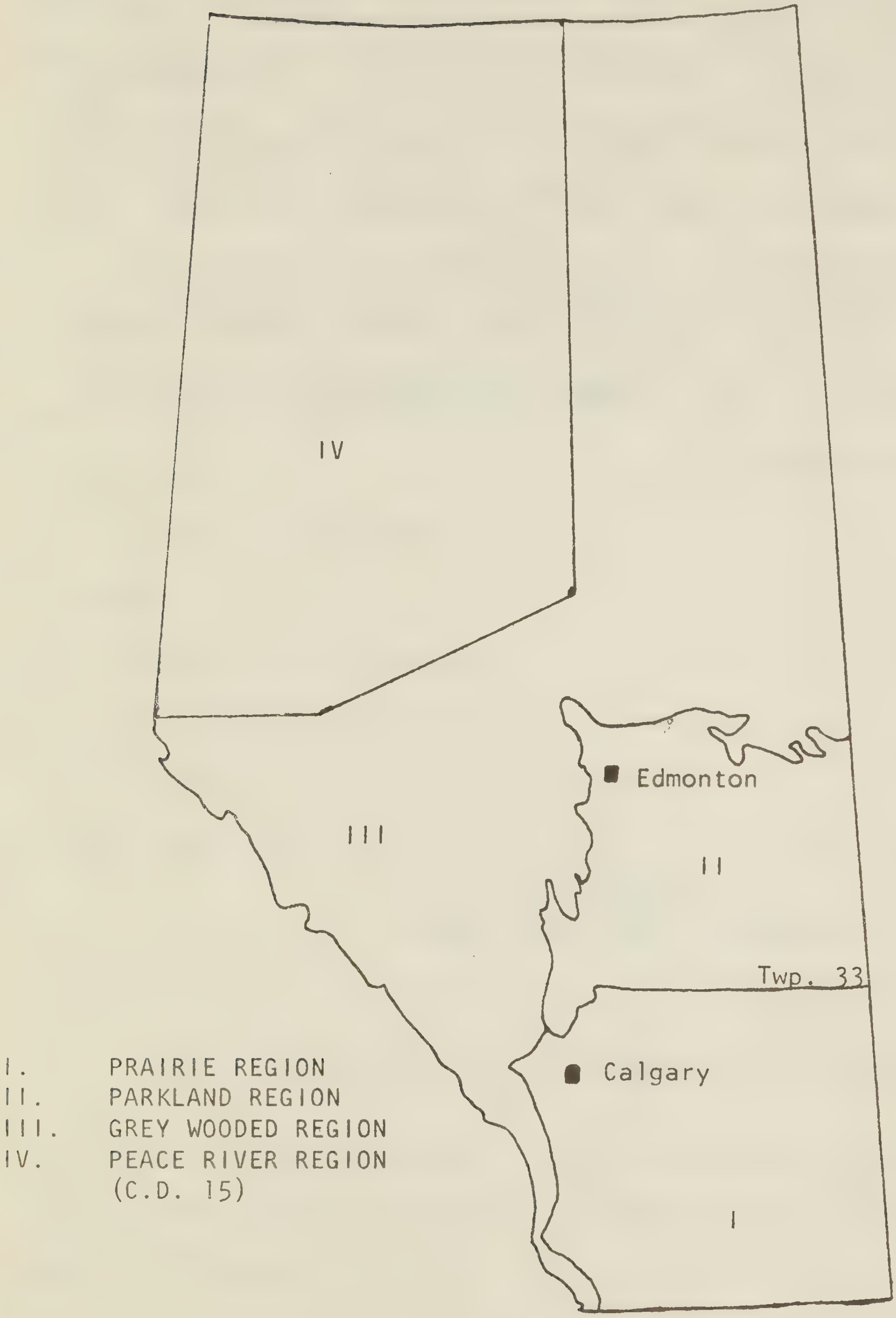

Table 2 outlines the relative sizes of the beef enterprises in terms of the number of animal units[1] in the defined regions. The first column indicates the average number of animal units for all beef enterprises which include cow-calf, cow-feeder and feeder operations. The second and third columns indicate the average and the median[2] number of animal units respectively only for the cow-calf enterprises.

TABLE 2

SIZE OF BEEF ENTERPRISE

| Region | Ave. No. A.U. All Enterprises | Ave. No. A.U. Cow-Calf Ent. | Median No. A.U. Cow-Calf Ent. |
|---|---|---|---|
| Prairie Region | 154 | 97 | 68 |
| Parkland Region | 72 | 63 | 56 |
| Grey-Wooded Region | 62 | 53 | 51 |
| Peace River Region | 42 | 45 | 32 |

Benefits from range improvement result from increased beef production per acre of land. The economic analysis outlined in Chapter 2 is based upon the increased carrying capacity of cow-calf enterprises because most respondents operated on a cow-calf basis. As well, the primary unit of production on range or pasture is the cow-calf operation. The decision to operate on a feeder basis is a managerial one and any additional benefits from such operations are not attributable to the productivity of the pasture. The analysis is based upon the median cow-calf enterprise since the median represents the typical operation which is the relevant consideration for policy purposes. The average may be unduly influenced by an unequal distribution of large or small enterprises. A comparison of the data in Table 2 indicates that there are relatively more small enterprises than large ones. Consequently, the effect of a few large operations increased the average enterprise size above the median value.

---

[1] An Animal Unit is defined as a 1000 lb. cow, with or without an unweaned calf at side, or equivalent.

[2] Median - the value occurring at the mid-point of a distribution, that is, there are an equal number of observations smaller and larger than the median value.

# CHAPTER II

# ECONOMIC GUIDELINES TO RANGE AND PASTURE IMPROVEMENT

## Methodology

This analysis uses a budgeting procedure. As mentioned in Chapter I, the median size of cow-calf enterprise on native pasture was used as the starting point. Net returns from the cow-calf enterprise are determined for the native pasture situation and for three levels of improved acreage and consequent herd sizes. Total net returns under these situations formed the basis of determining the extent to which range improvement is economically feasible.

The budgets are based largely upon data obtained in the survey, however, some costs and prices were derived from secondary sources. The following outline will clarify the basis and source of figures given in the budgets on pages 10, 13, 16 and 19.

i). Gross Returns - consist of the total receipts less transportation costs to market from the sale of stocker steer calves, heifer calves and culled cows. Calculation of gross receipts required data on percentage calf crops, weaning weights, cull cow weights, percentage of heifers sold and grades and prices of livestock. Prices consist of the average of the 1969 and 1970 livestock prices at the Edmonton and Calgary public stockyards. Calgary prices were used for the Prairie region. An average of the Edmonton and Calgary prices were used for the Parkland region and Edmonton prices were used for the Grey-Wooded and the Peace River regions. Comparative results are also given using an average of 1964 to 1970 livestock prices. 1964 and 1965 were low points of the beef price cycle while 1969 and 1970 are current highs. The analysis is based upon current livestock prices rather than a long-term average, on the assumption that beef prices in the forseeable future should be relatively nearer the current level. This forecast is based upon growing domestic demands and a stable growth in supply. The Appendix on pages 34 to 36 outline livestock prices and the necessary information required to calculate gross returns.

ii). Carrying capacities for native pastures were calculated from data obtained in the mail survey. The data obtained was not in sufficient detail to allow calculation of carrying capacities on improved pastures. Consequently, carrying capacities for improved pasture were based upon previous research and by consultation with personnel of the Grazing Branch of the Lands Division. The tables on page 37 outline the carrying capacities for native and improved pastures used in this study. Note that carrying capacities for improved pastures were set on a conservative basis so that with "normal" management, their productivity would be maintained at the carrying capacity indicated.

iii). Feed quantities and prices - quantities of feed used for the cow-calf enterprises were obtained in the survey. Prices of roughage, minerals and supplements were based upon available farm management data[1], generally over the previous five year period. Grain prices were based upon initial Lakehead prices less handling and transportation costs to various delivery points in the designated regions. Tables A-9 and A-10 on page 38 present this data.

iv). Other variable costs - consist of the cost of items such as veterinary and medicine costs, bedding straw, repairs to fences and buildings and allocated joint costs. These figures were obtained from available farm management data provided by the Production Research and Farm Management Branches of the Economics Division.

v). Land taxes and rental fees - these costs were based upon information provided by the respondents. They were determined initially for the carrying capacity for the native pastures. The increased taxation and rental costs per acre were taken into consideration on the acreage improved in the budgeting process. Examination of the budgets will indicate that even though these costs increase on a per acre basis, they are offset by the increased carrying capacity following improvement. A modest increase in these costs per A.U. is indicated only for the Peace River region.

vi). Depreciation charges - these costs were based on a 5% charge on the investment in buildings and facilities. Specialized beef cattle equipment was depreciated at an annual rate of 12 1/2%.

vii). Interest on investment - an investment charge of 6% of the investment in buildings, facilities, livestock equipment and the breeding herd was used. A similar charge for the investment in deeded pasture was not made, as this cost would remain constant and would not influence the analysis.

One should note that in the budgets (on pages 10, 13, 16 and 19), depreciation costs and the interest on investment in buildings and equipment decrease per animal unit as the scale of operation increases.

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[1] Cow-calf enterprise reports. Economics Division, A.D.A., 1965 to 1969.

This is based upon the supposition that even though the total investment in the beef enterprise increases as the scale of operation increases, investment costs per unit will decrease. Regression analysis was used to establish these costs based upon investment costs reported by the respondents.

vii). Labor costs - the total labor required for cow-calf enterprises was valued at $1.55 per hour. As indicated in the previous section for investment costs, one would expect labor requirements per animal unit to decrease as the scale of enterprise increases. Regression analysis was used to determine these relationships. The appendix, page 41, provides information in this regard.

The net returns to management and land investment[1] per animal unit form the basis upon which range improvement is judged economically feasible assuming a 6 and 8% interest rate and repayment periods of 10 and 20 years. Where there is surplus farm labor available, then the net returns to labor, management and land investment is the appropriate basis for subsequent analysis. As indicated by the hours of winter labor per day, this is the situation for most cow-calf operators. Consequently, the analysis for situation II where labor is not a limiting factor input, is appropriate for most individuals.

In the following section, Table 3 outlines cow-calf production costs and returns and associated data of interest for the Prairie region. Table 4 outlines the total annual increased net returns resulting from range improvement. The production loss during the period that the seeded acreage is becoming established is taken into consideration. Based upon these increased net returns per acre, Table 5 indicates the maximum improvement expenditure per acre which is economically feasible at alternative interest rates and pasture lives or repayment periods. One should note that these expenditures per acre are the maximum total expenditures and include all land improvement expenses and additional fencing costs which may be necessary. Comparable tables are given for the other regions.

---

[1] The residual return accruing to the cow-calf operator for his management input and as a return to deeded pasture investment.

### TABLE 3

### COW-CALF BUDGETS IN RELATION TO HERD SIZE
### PRAIRIE REGION

| | Native Pasture | Partially Improved Pasture | | |
|---|---|---|---|---|
| Size of Herd - No. A.U. | 68 | 72 | 76 | 80 |
| Native Pasture Acreage | 1570 | 1520 | 1470 | 1420 |
| Seeded Pasture Acreage | --- | 50 | 100 | 150 |
| Carrying Capacity - Native | 23.1 | 23.1 | 23.1 | 23.1 |
| (Ac./A.U. for 6.1 mo.) - Seeded | --- | 8.1 | 8.1 | 8.1 |
| | | Per A.U. | | |
| | | ($) | ($) | ($) |
| GROSS RETURNS | 120.54 | 120.54 | 120.54 | 120.54 |
| EXPENSES: | | | | |
| Roughage ( 1.4 T.) | 22.65 | | | |
| Grain (561 lb.) | 7.63 | | | |
| Supplements and Minerals | 2.86 | | | |
| Total Feed | 33.14 | 33.14 | 33.14 | 33.14 |
| Other Variable Costs | 11.79 | 11.79 | 11.79 | 11.79 |
| Taxes and Rental Costs | 8.20 | 8.22 | 8.25 | 8.27 |
| Deprec'n. - Bldgs., Facilities & Equip't. | 6.08 | 5.90 | 5.78 | 5.60 |
| Interest on Invest. - Bldgs. & Equip't. | 6.06 | 5.88 | 5.76 | 5.58 |
| - Livestock | 11.08 | 11.08 | 11.08 | 11.08 |
| Labor | 15.97 | 15.50 | 15.04 | 14.57 |
| TOTAL COST | 92.32 | 91.51 | 90.84 | 90.03 |
| Return to Mg't. & Land Invest. | 28.22 | 29.03 | 29.70 | 30.51 |
| Return to Labor, Mg't., & Land Invest. | 44.19 | 44.53 | 44.74 | 45.08 |
| PRODUCTION & COST COEFFICIENTS | | | | |
| Taxes and Rental Costs - ¢/ac. | 35.5 | 37.7 | 39.9 | 42.1 |
| Invest., Bldgs., Fac., & Equip't. - $ per A.U. | 101 | 98 | 96 | 93 |
| Total Labor - Hrs./A.U. | 10.3 | 10.0 | 9.7 | 9.4 |
| Total Winter Labor - Hrs./A.U. | 6.5 | 6.3 | 6.1 | 5.9 |
| Winter Labor - Hrs./Day | 3.7 | 3.8 | 3.9 | 3.9 |

## TABLE 4

## AVERAGE INCREASED NET RETURNS*<br>PRAIRIE REGION

| No. of Acres Improved | Total Annual Net Returns | Total Prod'n Loss (3 years) | Annual Increased Net Return** | |
|---|---|---|---|---|
| | | | Total | Per Ac. |
| 1. LABOR IS A LIMITING FACTOR INPUT | | | | |
| | ($) | ($) | ($) | ($) |
| 0 | 1919 | ---- | --- | ---- |
| 50 | 2090 | 183 | 153 | 3.05 |
| 100 | 2257 | 367 | 301 | 3.01 |
| 150 | 2441 | 549 | 467 | 3.11 |
| 11. LABOR IS NOT A LIMITING FACTOR INPUT | | | | |
| | ($) | ($) | ($) | ($) |
| 0 | 3005 | --- | --- | ---- |
| 50 | 3206 | 286 | 172 | 3.45 |
| 100 | 3400 | 574 | 338 | 3.38 |
| 150 | 3606 | 860 | 515 | 3.43 |

* Based upon data outlined in Table 3. Part I, Total Annual Net Return = No. of A.U. x Return to Mg't. and Land Investment. Part II, Total Annual Net Returns = No. of A.U. x Return to Labor, Mg't and Land Investment.

** $$\text{Annual Increased Net Returns} = \frac{\left(\text{Net Return Improved Pasture} - \text{Net Return Native Pasture} \times \text{Years}\right) - \text{Tota Proc Los}}{\text{Years}}$$

Note: A ten year productive period for the improved pasture was used for purposes of this calculation. If the pasture remained productive for a longer period, the average annual return would increase slightly.

## TABLE 5

## MAXIMUM IMPROVEMENT EXPENDITURES PRAIRIE REGION

| Average Added Return per Acre* | Interest Rate | Expenditure Per Acre** Repayment Period 10 Yrs. ($) | 20 Yrs. ($) |
|---|---|---|---|
| I. LABOR IS A LIMITING FACTOR INPUT | | | |
| 3.06 | 6% | 22.50 | 35.00 |
| 3.06 | 8% | 20.50 | 30.00 |
| II. LABOR IS NOT A LIMITING FACTOR INPUT | | | |
| 3.42 | 6% | 25.00 | 39.00 |
| 3.42 | 8% | 23.00 | 33.50 |

* A simple average of the annual increased net returns per acre for the improved acreages shown in Table 4.

** Rounded to nearest half-dollar.

## TABLE 6

## COW-CALF BUDGETS IN RELATION TO HERD SIZE
## PARKLAND REGION

|  | Native Pasture | Partially Improved Pasture |  |  |
|---|---|---|---|---|
| Size of Herd - No. A.U. | 56 | 59 | 63 | 70 |
| Native Pasture Acreage | 750 | 725 | 700 | 650 |
| Seeded Pasture Acreage | --- | 25 | 50 | 100 |
| Carrying Capacity - Native | 13.4 | 13.4 | 13.4 | 13.4 |
| (Ac./A.U. for 4.7 mo.) - Seeded | --- | 4.7 | 4.7 | 4.7 |
|  |  | Per A.U. |  |  |
|  |  | ($) | ($) | ($) |
| GROSS RETURNS | 114.83 | 114.83 | 114.83 | 114.83 |
| EXPENSES: |  |  |  |  |
| Roughage (2.5T.) | 42.85 |  |  |  |
| Grain ( 976 lbs.) | 13.18 |  |  |  |
| Supplements and Minerals | 2.81 |  |  |  |
| Total Feed | 58.84 | 58.84 | 58.84 | 58.84 |
| Other Variable Costs | 9.93 | 9.93 | 9.93 | 9.93 |
| Taxes and Rental Costs | 4.66 | 4.66 | 4.59 | 4.53 |
| Deprec'n. - Bldgs., Fac., & Equip't. | 6.46 | 6.26 | 6.01 | 5.55 |
| Interest on Invest. - Bldgs. & Equip't. | 5.94 | 5.76 | 5.52 | 5.10 |
| - Livestock | 10.31 | 10.31 | 10.31 | 10.31 |
| Labor | 21.08 | 20.46 | 19.69 | 18.60 |
| TOTAL COST | 117.22 | 116.22 | 114.89 | 112.86 |
| Return to Mg't. & Land Invest. | - 2.39 | - 1.39 | - 0.06 | 1.97 |
| Return to Labor, Mg't. & Land Invest. | 18.69 | 19.07 | 19.63 | 20.57 |
| PRODUCTION & COST COEFFICIENTS |  |  |  |  |
| Taxes and Rental costs - ¢/ac. | 34.8 | 36.7 | 38.5 | 42.3 |
| Invest., Bldgs., Fac., & Equip't. - $ per A.U. | 99 | 96 | 92 | 85 |
| Total Labor - Hrs./A.U. | 13.6 | 13.2 | 12.7 | 12.0 |
| Total Winter Labor - Hrs./A.U. | 10.4 | 10.1 | 9.7 | 9.2 |
| Winter Labor - Hrs./ day | 3.6 | 3.7 | 3.8 | 4.0 |

## TABLE 7

## AVERAGE INCREASED NET RETURNS*
## PARKLAND REGION

| No. of Acres Improved | Total Annual Net Returns | Total Prod'n Loss (3 years) | Annual Increased Net Returns | |
|---|---|---|---|---|
| | | | Total | Per Ac. |
| I. LABOR IS A LIMITING FACTOR INPUT | | | | |
| | ($) | ($) | ($) | ($) |
| 0 | - 140 | --- | --- | ---- |
| 25 | - 82 | --- | 58 | 2.32 |
| 50 | - 4 | --- | 136 | 2.72 |
| 100 | 138 | --- | 278 | 2.78 |
| II. LABOR IS NOT A LIMITING FACTOR INPUT | | | | |
| 0 | 1047 | --- | --- | ---- |
| 25 | 1125 | 70 | 71 | 2.84 |
| 50 | 1237 | 139 | 176 | 3.52 |
| 100 | 1440 | 279 | 365 | 3.65 |

* Derived from Table 6. The variation in the increased net returns per acre is due largely to indivisibilities in the computation process.

## TABLE 8

## MAXIMUM IMPROVEMENT EXPENDITURES PARKLAND REGION

| Average Added Return per Acre* | Interest Rate | Expenditure Per Acre<br>Repayment Period<br>10 Yrs. | <br><br>20 Yrs. |
|---|---|---|---|
| I. LABOR IS A LIMITING FACTOR INPUT | | | |
| ($) | | ($) | ($) |
| 2.61 | 6% | 19.00 | 30.00 |
| 2.61 | 8% | 17.50 | 25.50 |
| II. LABOR IS NOT A LIMITING FACTOR INPUT | | | |
| 3.34 | 6% | 24.50 | 38.50 |
| 3.34 | 8% | 22.50 | 33.00 |

* A simple average of the increased net returns per acre shown in Table 7.

### TABLE 9

### COW-CALF BUDGETS IN RELATION TO HERD SIZE
### GREY WOODED REGION

| | Native Pasture | Partially Improved Pasture | | |
|---|---|---|---|---|
| Size of Herd - No. A.U. | 51 | 56 | 60 | 69 |
| Native Pasture Acreage | 903 | 878 | 853 | 803 |
| Seeded Pasture Acreage | 0 | 25 | 50 | 100 |
| Carrying Capacity - Native | 17.7 | 17.7 | 17.7 | 17.7 |
| (Ac./A.U. for 4.2 mo.) - Seeded | -- | 4.2 | 4.2 | 4.2 |
| | | | Per A.U. | |
| | ($) | ($) | ($) | ($) |
| GROSS RETURNS | 107.70 | 107.70 | 107.70 | 107.70 |
| EXPENSES: | | | | |
| Roughage (2.9 T.) | 43.65 | | | |
| Grain (926 lb.) | 11.67 | | | |
| Supplements and Minerals | 1.90 | | | |
| Total Feed | 57.22 | 57.22 | 57.22 | 57.22 |
| Other Variable Costs | 9.56 | 9.56 | 9.56 | 9.56 |
| Taxes and Rental Costs | 3.56 | 3.54 | 3.58 | 3.60 |
| Deprec'n. - Bldgs., Fac., & Equip't. | 6.52 | 6.33 | 6.13 | 5.80 |
| Interest on Invest. --Bldgs. & Equip't. | 5.94 | 5.76 | 5.58 | 5.28 |
| - Livestock | 10.22 | 10.22 | 10.22 | 10.22 |
| Labor | 27.44 | 25.27 | 23.87 | 21.08 |
| TOTAL COST | 120.46 | 117.90 | 116.16 | 112.76 |
| Return to Mg't. & Land Invest. | - 12.76 | - 10.20 | - 8.46 | - 5.06 |
| Return to Labor, Mg't & Land Invest. | 14.68 | 15.07 | 15.41 | 16.02 |
| PRODUCTION & COST COEFFICIENTS | | | | |
| Taxes and Rental Costs - $/ac. | 20.1 | 21.9 | 23.8 | 27.5 |
| Invest., Bldgs., Fac., & Equip't. - $/A.U. | 99 | 96 | 93 | 88 |
| Total Labor - Hrs./A.U. | 17.7 | 16.3 | 15.4 | 13.6 |
| Total Winter Labor - Hrs./A.U. | 13.6 | 12.5 | 11.8 | 10.4 |
| Winter Labor - Hrs./Day | 3.6 | 3.6 | 3.7 | 3.7 |

## TABLE 10

## AVERAGE INCREASED NET RETURNS* GREY WOODED REGION

| No. of Acres Improved | Total Annual Net Returns | Total Prod'n Loss (3 years) | Annual Increased Net Returns | |
|---|---|---|---|---|
| | | | Total | Per Ac. |
| I. LABOR IS A LIMITING FACTOR INPUT | | | | |
| | ($) | ($) | ($) | ($) |
| 0 | - 651 | ---- | --- | ---- |
| 25 | - 571 | ---- | 80 | 3.20 |
| 50 | - 508 | ---- | 143 | 2.86 |
| 100 | - 349 | ---- | 302 | 3.02 |
| II. LABOR IS NOT A LIMITING FACTOR INPUT | | | | |
| 0 | 749 | --- | --- | ---- |
| 25 | 844 | 41 | 91 | 3.64 |
| 50 | 925 | 83 | 168 | 3.36 |
| 100 | 1105 | 166 | 339 | 3.39 |

* Derived from Table 9. The variation in the increased net returns per acre is due largely to indivisibilities in the computation process.

## TABLE 11

## MAXIMUM IMPROVEMENT EXPENDITURES GREY WOODED REGION

| Average Added Return per Acre* | Interest Rate | Expenditure Per Acre | |
|---|---|---|---|
| | | Repayment Period | |
| | | 10 Yrs. | 20 Yrs. |
| I. LABOR IS A LIMITING FACTOR INPUT | | | |
| ($) | | ($) | ($) |
| 3.03 | 6% | 22.50 | 35.00 |
| 3.03 | 8% | 20.50 | 30.00 |
| II. LABOR IS NOT A LIMITING FACTOR INPUT | | | |
| 3.46 | 6% | 25.50 | 39.50 |
| 3.46 | 8% | 23.00 | 34.00 |

* A simple average of the increased net returns per acre shown in Table 10.

## TABLE 12

## COW-CALF BUDGETS IN RELATION TO HERD SIZE
## PEACE RIVER REGION

| | Native Pasture | Partially Improved Pasture | | |
|---|---|---|---|---|
| Size of Herd - No. A.U. | 32 | 37 | 42 | 52 |
| Native Pasture Acreage | 768 | 743 | 718 | 668 |
| Seeded Pasture Acreage | --- | 25 | 50 | 100 |
| Carrying Capacity - Native | 24 | 24 | 24 | 24 |
| (Ac./A.U. for 4.2 mo.) - Seeded | --- | 4.2 | 4.2 | 4.2 |
| | | | Per A.U. | |
| | ($) | ($) | ($) | ($) |
| GROSS RETURNS | 107.66 | 107.66 | 107.66 | 107.66 |
| EXPENSES: | | | | |
| Roughage (2.94 T.) | 46.36 | | | |
| Grain (1164 lb.) | 13.74 | | | |
| Supplements and Minerals | 1.64 | | | |
| Total Feed | 61.74 | 61.74 | 61.74 | 61.74 |
| Other Variable Costs | 9.61 | 9.61 | 9.61 | 9.61 |
| Taxes and Rental Costs | 2.62 | 2.78 | 2.90 | 3.07 |
| Deprec'n.,- Bldgs., Fac., & Equip't. | 5.74 | 5.43 | 5.12 | 4.68 |
| Interest on Investment - Bldgs., & Equip't. | 5.52 | 5.22 | 4.92 | 4.50 |
| - Livestock | 9.84 | 9.84 | 9.84 | 9.84 |
| Labor | 42.47 | 39.37 | 36.74 | 32.71 |
| TOTAL COST | 137.54 | 133.99 | 130.87 | 126.15 |
| Return to Mg't & Land Invest. | -29.88 | -26.33 | -23.21 | -18.49 |
| Return to Labor, Mg't. & Land Invest. | 12.59 | 13.04 | 13.53 | 14.22 |
| PRODUCTION & COST COEFFICIENTS | | | | |
| Taxes and Rental Costs - ¢/ac. | 10.9 | 13.4 | 15.8 | 20.8 |
| Invest., Bldgs., Fac. & Equip't. - $/A.U. | 92 | 87 | 82 | 75 |
| Total Labor - Hrs./A.U. | 27.4 | 25.4 | 23.7 | 21.1 |
| Total Winter Labor - Hrs./A.U. | 20.6 | 19.1 | 17.8 | 15.8 |
| Winter Labor - Hrs./Day | 3.4 | 3.6 | 3.8 | 4.2 |

## TABLE 13

## AVERAGE INCREASED NET RETURNS*
## PEACE RIVER REGION

| No. of Acres Improved | Total Annual Net Returns | Total Prod'n Loss (3 Years) | Annual Increased Net Returns Total | Annual Increased Net Returns Per Ac. |
|---|---|---|---|---|
| I. LABOR IS A LIMITING FACTOR INPUT | ($) | ($) | ($) | ($) |
| 0 | - 956 | --- | --- | ---- |
| 25 | - 974 | --- | - 18 | -.72 |
| 50 | - 975 | --- | - 19 | -.38 |
| 100 | - 961 | --- | - 5 | -.05 |
| II. LABOR IS NOT A LIMITING FACTOR INPUT | | | | |
| 0 | 403 | --- | --- | ---- |
| 25 | 482 | 27 | 76 | 3.04 |
| 50 | 568 | 52 | 160 | 3.20 |
| 100 | 739 | 105 | 326 | 3.26 |

* Derived from Table 12.

## TABLE 14

## MAXIMUM IMPROVEMENT EXPENDITURES
## PEACE RIVER REGION

| Average Added Return per Acre* | Interest Rate | Expenditure Per Acre Repayment Period 10 Yrs. | Expenditure Per Acre Repayment Period 20 Yrs. |
|---|---|---|---|
| I. LABOR IS A LIMITING FACTOR INPUT | | | |
| ($) | | ($) | ($) |
| - 0.38 | 6% | 0 | 0 |
| - 0.38 | 8% | 0 | 0 |
| II. LABOR IS NOT A LIMITING FACTOR INPUT | | | |
| 3.17 | 6% | 23.50 | 36.50 |
| 3.17 | 8% | 21.50 | 31.00 |

* A simple average of the increased net returns per acre shown in Table 13.

## Maximum Pasture Improvement Expenditures Summarized by Region

Table 15 summarizes the information outlined in Tables 5, 8, 11, and 14.

### TABLE 15

### A SUMMARY OF MAXIMUM PASTURE IMPROVEMENT EXPENDITURES (1969 - '70 Livestock Prices)

| | Maximum Expenditure - $ per Acre<br>Interest Rate and Repayment Period | | | |
|---|---|---|---|---|
| Region | 8%-10 Years | 6%-10 Years | 8%-20 Years | 6%-20 Years |
| I. LABOR IS A LIMITING FACTOR INPUT | | | | |
| PRAIRIE | 20.50 | 22.50 | 30.00 | 35.00 |
| PARKLAND | 17.50 | 19.00 | 25.50 | 30.00 |
| GREY WOODED | 20.50 | 22.50 | 30.00 | 35.00 |
| PEACE RIVER | 0 | 0 | 0 | 0 |
| II. LABOR IS NOT A LIMITING FACTOR INPUT | | | | |
| PRAIRIE | 23.00 | 25.00 | 33.50 | 39.00 |
| PARKLAND | 22.50 | 24.50 | 33.00 | 38.50 |
| GREY WOODED | 23.00 | 25.50 | 34.00 | 39.50 |
| PEACE RIVER | 21.50 | 23.50 | 31.00 | 36.50 |

These figures illustrate that the extent to which expenditure on range or pasture improvement is economically feasible is very much dependent upon the interest rate and upon the expected pasture life or repayment period. Table 16 outlines comparable information using an average of the 1964 to 1970 livestock prices in calculating gross returns to the cow-calf operations.[1]

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[1] See Appendix, p. 34, 1964 and 1965 were previous lows in the cattle price cycle, 1969 and 1970 are current highs.

## TABLE 16

## MAXIMUM PASTURE IMPROVEMENT EXPENDITURES
1964 to 1970 Livestock Prices

| Region | Maximum Expenditure - $ per Acre<br>Interest Rate and Repayment Period<br>8%-10 Years | <br><br>6%-10 Years | <br><br>8%-20 Years | <br><br>6%-20 Years |
|---|---|---|---|---|
| I. LABOR IS A LIMITING FACTOR INPUT | | | | |
| PRAIRIE | 8.50 | 9.50 | 12.50 | 14.50 |
| PARKLAND | 0 | 0 | 0 | 0 |
| GREY WOODED | 0 | 0 | 0 | 0 |
| PEACE RIVER | 0 | 0 | 0 | 0 |
| II. LABOR IS NOT A LIMITING FACTOR INPUT | | | | |
| PRAIRIE | 11.00 | 12.00 | 16.00 | 18.50 |
| PARKLAND | 0.50 | 0.50 | 1.00 | 1.00 |
| GREY WOODED | 0 | 0 | 0 | 0 |
| PEACE RIVER | 0 | 0 | 0 | 0 |

Due to lower cattle prices over this time period, average net returns from cow-calf production did not justify expenditure on pasture or range improvement with the exception of the Prairie region. Considering that regrassing costs would normally run at $10 to $15 per acre in this region, improvement practices in the past have only been a marginal venture.

### Time Required to Recover Pasture Improvement Costs

Within any region, improvement costs may vary considerably depending upon specific land characteristics and the method of improvement. Table 17 outlines the number of years required to recover various levels of improvement costs at two interest rates using the indicated increased net return per acre where labor is not a limiting factor input.

TABLE 17

YEARS REQUIRED TO RECOVER PASTURE IMPROVEMENT COSTS

| Added Annual Return per Acre | Discount Rate | Years to Recover Improvement Costs | | | | |
|---|---|---|---|---|---|---|
| | | | Improvement Cost - per Acre | | | |
| | | $8 | $12 | $16 | $20 | $24 |
| Prairie Region | | | | | | |
| 3.42 | 6% | 2.6 | 4.1 | 5.7 | 7.4 | 9.4 |
| 3.42 | 8% | 2.7 | 4.3 | 6.1 | 8.2 | 10.7 |
| | | | Improvement Cost - per Acre | | | |
| | | $15 | $20 | $25 | $30 | $35 |
| Parkland Region | | | | | | |
| 3.34 | 6% | 5.4 | 7.6 | 10.2 | 13.3 | 17.0 |
| 3.34 | 8% | 5.8 | 8.5 | 11.9 | 16.5 | 23.7 |
| | | | Improvement Cost - per Acre | | | |
| | | $20 | $25 | $30 | $35 | $40 |
| Grey Wooded Region | | | | | | |
| 3.46 | 6% | 7.0 | 9.8 | 12.6 | 16.0 | 20.3 |
| 3.46 | 8% | 8.1 | 11.2 | 15.4 | 21.5 | 33.6 |
| Peace River Region | | | | | | |
| 3.17 | 6% | 8.2 | 11.0 | 14.4 | 18.6 | 24.3 |
| 3.17 | 8% | 9.1 | 13.0 | 18.4 | 27.9 | >50 |

An improvement cost of $12 per acre in the Prairie region, for example, could be recovered in approximately a 4 year period. An improvement cost of $30 per acre in the Grey Wooded region would require about 13 and 15 years respectively to recover at the interest rates indicated. Figures 2 to 5, pp. 25 - 26, illustrate these relationships graphically.

## A Benefit-Cost Assessment of Range and Pasture Improvement

From the point of view of economic efficiency, the benefits from a development project must be compared to the costs. For example, in the Prairie region, an annual return of 3.42 per acre discounted at 8% over a ten year period is worth $23.00 today. Table 15, p. 21 outlines comparable data for the other regions. Assuming that $12, $20 and $30 per acre are typical costs of pasture improvement in the Prairie, Parkland and the Grey Wooded and Peace River regions respectively, then the benefit-cost ratios would be: (for a 10 year pasture life and at an 8% rate of discount)

1.9 to 1 for the Prairie region,
1.1 to 1 for the Parkland region,
0.8 to 1 for the Grey Wooded region, and
0.7 to 1 for the Peace River region.

Similarly, if the improved pasture remained productive for a 20 year period, then the respective benefit-cost ratios would be:

2.8 to 1 for the Prairie region,
1.7 to 1 for the Parkland region,
1.1 to 1 for the Grey Wooded region, and
1.0 to 1 for the Peace River region.

The actual benefit-cost ratios would depend of course, upon the individual situation. However, one could safely conclude that the relationship between the four regions with respect to range improvement is as indicated by these ratios.

FIGURE 2

YEARS TO RECOVER IMPROVEMENT COSTS - PRAIRIE REGION

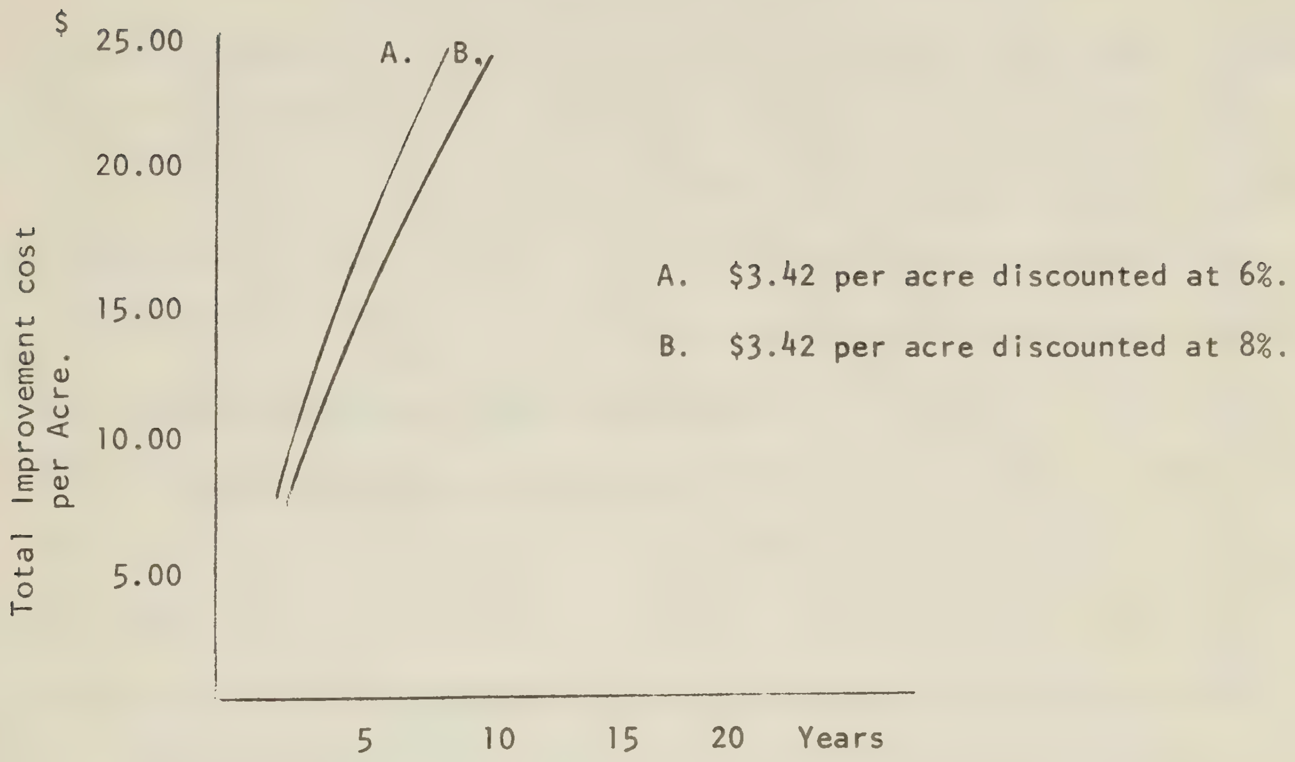


FIGURE 3

YEARS TO RECOVER IMPROVEMENT COSTS - PARKLAND REGION

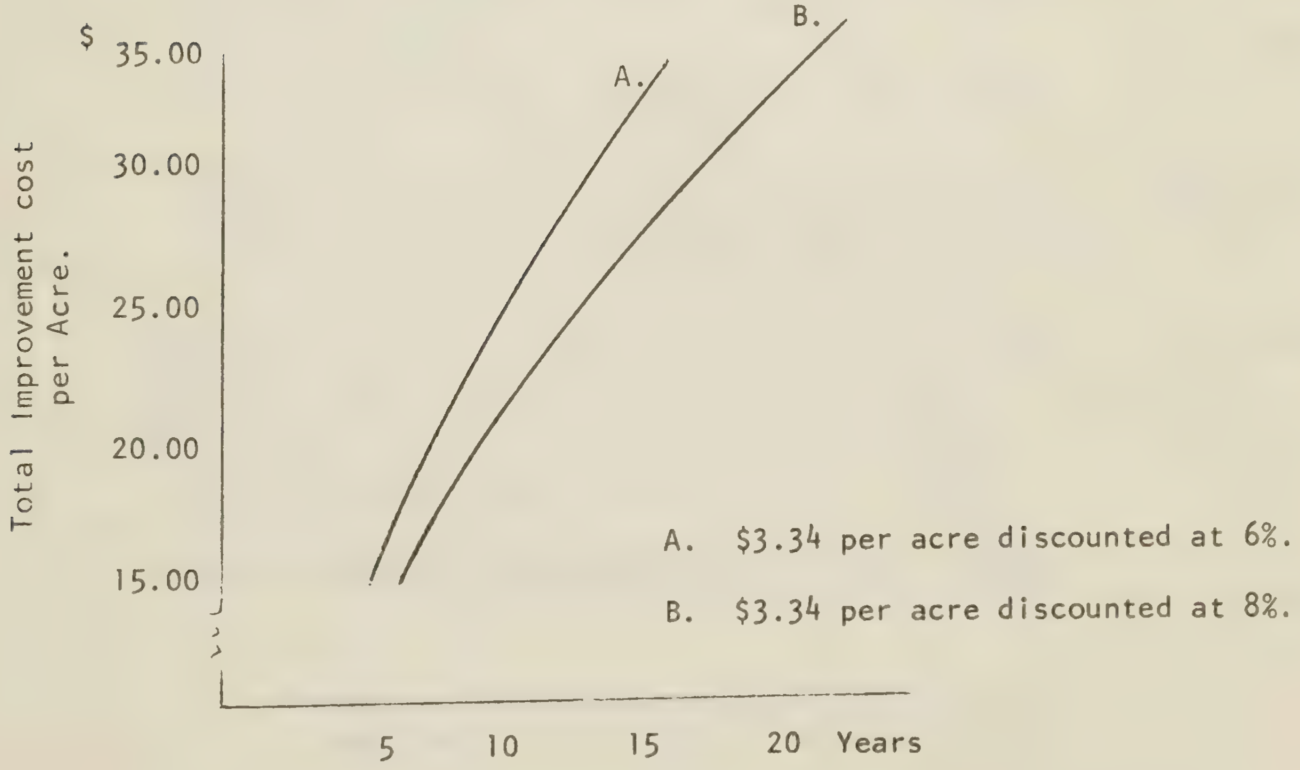


FIGURE 4

YEARS TO RECOVER IMPROVEMENT COSTS - GREY WOODED REGION

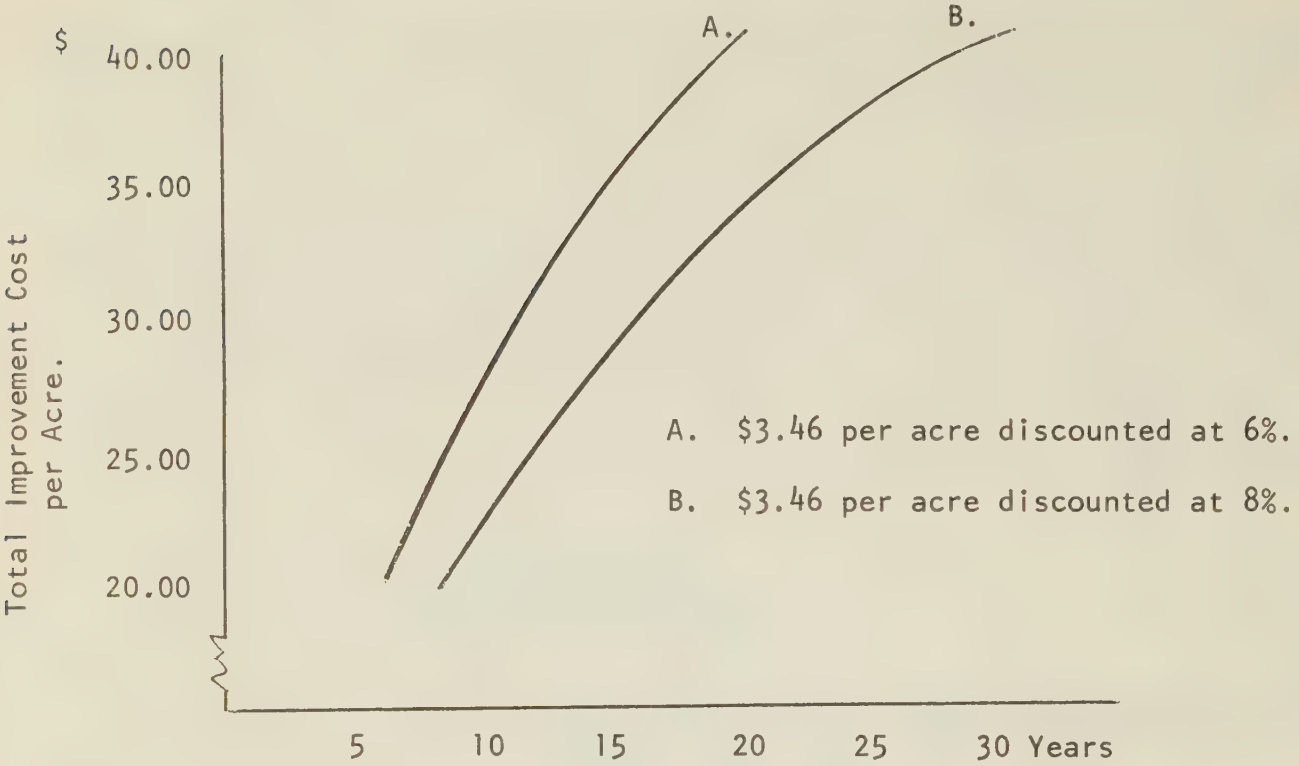
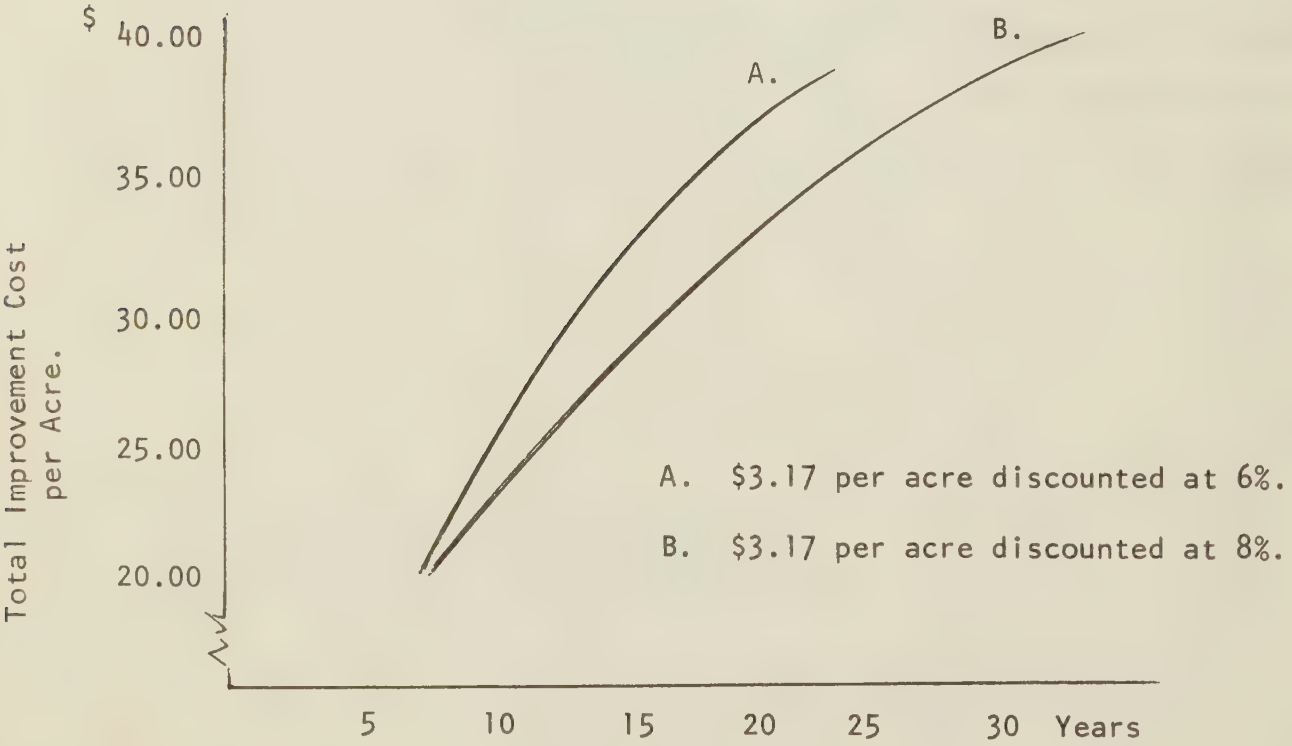


FIGURE 5

YEARS TO RECOVER IMPROVEMENT COSTS - PEACE RIVER



## Fertilization of Seeded Pastures

The following analysis, in general terms, provides guidelines on the economic feasibility of fertilizing seeded pastures. Fertilizer requirements were based upon usual nutrient deficiencies in designated regions of the province.[1] Literature provided by the Federal Research Stations at Lethbridge, Lacombe and Beaverlodge provided information on pasture response to various fertilization trials. Although a considerable number of tests have been carried out at various locations in the province, the results have been quite variable. The test results indicate that the response to fertilization of seeded pastures is dependent upon a number of factors. The natural fertility of the soil, the type and quantity of the fertilizer applied and weather conditions are some of the most important factors.

The economics of fertilization is directly dependent upon the increase in net income resulting from the additional beef produced. The increase in net income is influenced by:

i. The pasture response to fertilization in terms of the increased carrying capacity,

ii. the quantity and cost of the fertilizer required,

iii. the scale of livestock operation and the increase in livestock production efficiency which will result from the increased scale of operation. Economies in overhead costs and labor use should be realized with expanded size of operation.

In practical terms, because of the large variability in response and the number of other influencing factors, the economics of fertilization must be assessed for each individual situation. Consequently, the following analysis has only attempted to indicate general guidelines on the extent of the increase in forage production which would be necessary above that determined previously for seeded pastures in order to cover the cost of fertilization shown. A budgeting process similar to that outlined in Tables 3, 6, 9 and 12 was used in order to determine the break-even increase in carrying capacity. A larger increase than that indicated in Table 18 would be necessary in order to allow a margin of profit.

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[1] Soil and Feed Testing Laboratory, A.D.A., Edmonton.

TABLE 18

BREAK-EVEN INCREASE IN CARRYING CAPACITY NECESSARY TO PAY FOR COST OF FERTILIZATION*

| | Prairie Region | Parkland Region | Grey Wooded Region | Peace River Region |
|---|---|---|---|---|
| Cost of Feriilization per Acre | $4.40 | $5.80 | $6.35 | $6.35 |
| Carrying Capacity - Ac./A.U.M. | | | | |
| Seeded Pasture | 1.33 | 1.0 | 1.0 | 1.0 |
| Seeded & Fertilized Pasture | 0.8 | 0.5 | 0.48 | 0.43 |
| Carrying Capacity - Ac./A.U. for Pasture Season | | | | |
| Seeded Pasture | 8.1 | 4.7 | 4.2 | 4.2 |
| Seeded & Fertilized Pasture | 4.9 | 2.4 | 2.0 | 1.8 |
| Approximate Percentage Increase in C.C. or Forage Prod'n Required | 66% | 100% | 110% | 133% |

* The cost of fertilization includes a $0.50 per acre charge to cover total costs of application. Fertilizers applied were:

Prairie region - 100 lb. of 34-0-0 per acre.
Parkland region - 75 lb. of 34-0-0 and 50 lb. of 11-48-0 per acre.
Grey Wooded & Peace River regions - 150 lb. of 34-0-0 (S) per acre.

A 66% increase in pasture forage production would be necessary in order to cover the $4.40 cost of fertilization in the Prairie region. Similarly, forage production would have to double in the Parkland region, and increase by approximately 110% and 133% respectively in the Grey Wooded and Peace River regions. Additional information on the necessary forage production to achieve the carrying capacities indicated for improved pastures is given in Table A-8, on page 37.

# CHAPTER III

## SUMMARY AND CONCLUSIONS

1. The economic feasibility of range improvement is dependent upon three major factors:

    i. the increase in productivity of the seeded pasture compared to the native pasture,

    ii. the cost to improve native pasture, and

    iii. the length of pasture life.

This study was designed to determine the maximum expenditure economically feasible for pasture improvement assuming a ten and a twenty year pasture life. Thus an individual knowing the cost to improve native pasture and the expected length of pasture life, can judge the economic feasibility of the undertaking.

2. Average carrying capacities for native pastures were determined from information obtained in the survey of grazing lease holders. The carrying capacity of seeded pastures was established by reference to available literature and by consultation with members of the Grazing Branch of the Lands Division. These grazing capacities were as follows:

| | Ac. per A.U.M.* | | Increase in |
|---|---|---|---|
| | Native Pasture | Seeded Pasture | Carrying Capacity |
| Prairie Region | 3.78 | 1.33 | 2.8 times |
| Parkland Region | 2.85 | 1.0 | 2.8 times |
| Grey Wooded Region | 4.21 | 1.0 | 4.2 times |
| Peace River Region | 5.73 | 1.0 | 5.7 times |

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* Acres per animal unit month - the number of acres required to pasture 1 cow or cow equivalent for 1 month.

Any deviation from these carrying capacities will affect the economics of improvement as determined in this study, directly.

3. Range improvement will result in increased net returns per acre from beef production on the acreage improved due to the increased carrying capacity. The following figures indicate the nature of this increased annual return and the present value of the added return accumulated for 10 and 20 years respectively using an 8% rate of discount. These figures are based upon 1969-'70 livestock prices and no charge has been placed on the labor input involved in livestock production.

| | Increased Annual Returns - $ per Ac. | Amount which can be Spent to return 8% on the Investment | |
|---|---|---|---|
| | | 10 Years | 20 Years |
| Prairie Region | 3.42 | $23.00 | $33.50 |
| Parkland Region | 3.34 | 22.50 | 33.00 |
| Grey Wooded Region | 3.46 | 23.00 | 34.00 |
| Peace River Region | 3.17 | 21.50 | 31.00 |

An expenditure of $23 per acre on range improvement in the Prairie Region, for example, would return 8% on capital invested over a 10 year period. Consequently, the extent to which expenditure on range improvement is feasible, will depend upon the life of the improved pasture and the cost of capital. (See Table 15, page 21).

4. Improvement costs may vary considerably within a given region, consequently, the length of time required to recover capital invested will also show considerable variation. As well, average improvement costs for the regions defined in this study, are likely to differ. If, for example, average improvement costs are $12, $20 and $30 per acre for the Prairie, Parkland and the Grey Wooded and Peace River regions respectively, then the average length of time required to recover these costs (at an 8% rate of discount) would be:

| | |
|---|---|
| Prairie Region | - 4.3 years |
| Parkland Region | - 8.5 years |
| Grey Wooded Region | - 15.4 years |
| Peace River Region | - 18.4 years |

5. The economics of range improvement are enhanced by the provisions of the Income Tax Act which permit capital expenditures for land improvement to be deducted as annual operating expenditures. This may be a very important consideration for the individual farmer or rancher. For example, an improvement cost of $30 per acre for the operator who is within a 25% income tax bracket, would in effect amount to an actual cost of $22.50 per acre after income tax considerations. Net improvement costs are the important consideration for the individual.

6. A comparison of benefits to costs is necessary in order to obtain a measure of economic efficiency. These relationships are given on page 24. This study indicates that the benefit-cost ratio improves as one moves from the Wooded to the Parkland to the Prairie regions of Alberta.

7. Changes in cattle prices and production costs will of course, affect the economics of range improvement directly. This analysis is based upon 1969 and 1970 cattle prices. A growing population and an increasing level of per capita consumption should maintain the bouyant price level into the foreseeable future if a stable growth in supply is achieved.

8. The two most prominent reasons given by the respondents for not undertaking improvement work in all regions and for both leased and deeded land were:

- i) Financial limitations and/or prohibitive improvement costs;
- ii) Land was unsuitable for improvement.

9. If economic efficiency is of primary concern, promotion of range improvement should be emphasized in the non-wooded regions of the province since returns to capital invested are largest in this area. If providing equality of opportunity is the criterion, a differentiated program for the various regions of the province is not possible.

10. Because of the number of factors influencing the response to fertilization of seeded pastures, the economic feasibility of this practise should be assessed for each situation. Pages 27 to 29 outline some guidelines in this respect.

# APPENDIX

## TABLE A-1

## LIVESTOCK PRICES - 1969 and '70*

| | EDMONTON | CALGARY |
|---|---|---|
| | $/cwt | |
| Stocker Steers - good | 37.94 | 39.15 |
| common | 31.98 | 34.38 |
| Stocker Heifers - good | 32.37 | 32.99 |
| common | 28.48 | 29.67 |
| Cows - good | 21.17 | 21.89 |
| medium | 19.80 | 20.70 |
| canners and cutters | 17.44 | 18.55 |

* Stocker Steer and Heifer prices are average prices for October and November. Cow prices are average yearly prices.

## TABLE A-2

## LIVESTOCK PRICES - 1964 to 1970

| | EDMONTON | CALGARY |
|---|---|---|
| | $/cwt | |
| Stocker Steers - good | 29.18 | 30.71 |
| common | 24.07 | 26.36 |
| Stocker Heifers - good | 23.94 | 24.86 |
| common | 20.33 | 21.91 |
| Cows - good | 17.60 | 18.17 |
| medium | 16.34 | 17.04 |
| canners and cutters | 14.16 | 15.11 |

## TABLE A-3

## CALF CROPS; CULLING RATES

| | Calf Crop (%) | Culling Rate (%) |
|---|---|---|
| Prairie Region | 89.3 | 11.5 |
| Parkland Region | 87.7 | 11.1 |
| Grey-Wooded Region | 83.1 | 10.5 |
| Peace River Region | 88.1 | 10.7 |

## TABLE A-4

## LIVESTOCK WEIGHTS

| | Weaning Weight (lb.) | | Cull Cows |
|---|---|---|---|
| | Stocker Steer Calves | Stocker Heifer Calves | Sold (lb.) |
| Prairie Region | 448 | 407 | 1088 |
| Parkland Region | 454 | 405 | 1053 |
| Grey-Wooded Region | 464 | 420 | 1069 |
| Peace River Region | 461 | 420 | 1082 |

## TABLE A-5

## LIVESTOCK GRADES

| | Stocker Steer Calves | | Stocker Heifer Calves | | Cull Cows | | |
|---|---|---|---|---|---|---|---|
| | % Good | % Common | % Good | % Common | % Good | % Medium | % C. & C. |
| Prairie Region | 85 | 15 | 83 | 17 | 45 | 34 | 21 |
| Parkland Region | 75 | 25 | 71 | 29 | 31 | 42 | 27 |
| Grey-Wooded Region | 74 | 26 | 68 | 32 | 32 | 54 | 14 |
| Peace River Region | 72 | 28 | 68 | 32 | 39 | 49 | 12 |

## TABLE A-6

## LIVESTOCK TRANSPORTATION COSTS

| | $ / cwt to Market |
|---|---|
| Prairie Region | 0.43 |
| Parkland Region | 0.55 |
| Grey-Wooded Region | 0.62 |
| Peace River Region | 0.96 |

## TABLE A-7

## CARRYING CAPACITIES ON NATIVE & SEEDED PASTURES

| | Native Pastures | | Seeded Pastures | |
|---|---|---|---|---|
| | Ac./A.U.M.* | Ac./A.U. (12 mo.) | Ac./A.U.M. | Ac./A.U. (12 mo.) |
| rairie Region | 3.78 | 45.4 | 1.33 | 16.0 |
| arkland Region | 2.85 | 34.2 | 1.0 | 12 |
| rey Wooded Region | 4.21 | 50.5 | 1.0 | 12 |
| eace River Region | 5.73 | 68.8 | 1.0 | 12 |

* Acres per Animal Unit Month - the number of acres required to pasture 1 cow or cow equivalent for 1 month.

## TABLE A-8

## FORAGE PRODUCTION & CARRYING CAPACITY ON IMPROVED PASTURES

| | Prairie Region | Parkland Region | Grey Wooded Region | Peace River Region |
|---|---|---|---|---|
| eeded Pasture | | | | |
| orage Production - lb./ac. | 900 | 1200 | 1200 | 1200 |
| - tons/ac. | 0.45 | 0.6 | 0.6 | 0.6 |
| vailable forage - lb./ac.* | 675 | 900 | 900 | 900 |
| orage requirements - lb./A.U.M. | 900 | 900 | 900 | 900 |
| cres required/A.U.M. | 1.33 | 1.0 | 1.0 | 1.0 |
| cres required/A.U. for grazing season | 8.1 | 4.7 | 4.2 | 4.2 |
| eeded & Fertilized Pasture** | | | | |
| orage Production - lb./ac. | 1500 | 2400 | 2500 | 2800 |
| - tons/ac. | 0.75 | 1.2 | 1.25 | 1.4 |
| vailable forage - lb./ac.* | 1125 | 1800 | 1875 | 2100 |
| orage requirements - lb./A.U.M. | 900 | 900 | 900 | 900 |
| cres required/A.U.M. | 0.8 | 0.5 | 0.48 | 0.43 |
| cres required/A.U. for grazing season | 4.9 | 2.4 | 2.0 | 1.8 |

* Based upon 75% utilization of forage produced.

** The forage production necessary in order to pay for the cost of fertilization shown in Table 18.

## TABLE A-9

## FEED USE

| | TOTAL ROUGHAGE | | TOTAL GRAIN | |
|---|---|---|---|---|
| | Tons/A.U. | Lbs./A.U./Day* | Lbs./A.U. | Lbs./A.U./Day* |
| Prairie Region | 1.40 | 23.3 | 561 | 4.7 |
| Parkland Region | 2.5 | 30.7 | 976 | 6.0 |
| Grey-Wooded Region | 2.9 | 30.3 | 926 | 4.8 |
| Peace River Region | 2.9 | 30.1 | 1164 | 6.0 |

* Calculated on days of winter feeding.

## TABLE A-10

## FEED PRICES

| | All Roughage ($/ton) | Oats (¢/bu.) | Barley (¢/bu.) |
|---|---|---|---|
| Prairie Region | 16.18 | 43 | 70 |
| Parkland Region | 17.21 | 43 | 70 |
| Grey-Wooded Region | 15.00 | 40 | 66 |
| Peace River Region | 15.77 | 35 | 62 |

## TABLE A-11

## LENGTH OF PASTURING AND WINTER FEEDING PERIODS

| | Summer Pasturing (Mo.) | Crop Residue Pasturing (Mo.) | Winter Feeding (Mo.) |
|---|---|---|---|
| Prairie Region | 6.1 | 1.9 | 4.0 |
| Parkland Region | 4.7 | 1.9 | 5.4 |
| Grey-Wooded Region | 4.2 | 1.4 | 6.4 |
| Peace River Region | 4.2 | 1.3 | 6.5 |

## TABLE A-12

## AVERAGE ANNUAL LAND COSTS (¢ per Acre)

| | Prairie | | Parkland | | Grey-Wooded | | Peace River | |
|---|---|---|---|---|---|---|---|---|
| | L & F Lease | Deeded, Other | L & F Lease | Deeded, Other | L & F Lease | Deeded, Other | L & F Lease | Deeded, Other |
| Taxes | 23.4 | 34.6 | 26.2 | 34.9 | 17.2 | 25.8 | 7.5 | 28.4 |
| Rental | 8.5 | ---- | 8.1 | ---- | 5.0 | ---- | 3.7 | ---- |
| Taxes and Rental* | 31.9 | 43.1 | 34.3 | 35.5 | 22.2 | 30.1 | 11.2 | 31.3 |
| Wt'd Ave. Total Land Cost** | 36.1 | | 35.0 | | 24.9 | | 16.5 | |

* For deeded lands, this figure includes the charges for pastures which were rented privately.

** Taxes and rental costs on both leased and deeded lands combined in proportion to the relative quantity of leased and deeded pasture lands.

## TABLE A-13

## INVESTMENT IN BUILDINGS, FACILITIES AND EQUIP'T - COW CALF ENTERPRIZES

| | $ per A.U. at Average Herd Size | $ per A.U. at Median Herd Size |
|---|---|---|
| Prairie Region | 85 | 101 |
| Parkland Region | 92 | 99 |
| Grey-Wooded Region | 98 | 99 |
| Peace River Region | 80 | 92 |

## TABLE A-14

## TOTAL LABOR REQUIREMENTS - COW CALF ENTERPRIZES

| | Hrs. per A.U. at Average Herd Size | Hrs. per A.U. at Median Herd Size |
|---|---|---|
| Prairie Region | 8.4 | 10.3 |
| Parkland Region | 12.7 | 13.6 |
| Grey-Wooded Region | 17.1 | 17.7 |
| Peace River Region | 22.8 | 27.4 |

## TABLE A-15

## RELATIONSHIP OF INVESTMENT COSTS TO SCALE OF ENTERPRISE*

| No. of Animal Units | Investment in Buildings, Facilities and Equip't. per A.U.<br>Prairie Region ($) | Parkland Region ($) | Grey-Wooded Region ($) | Peace River Region ($) |
|---|---|---|---|---|
| 25 | 164 | 171 | 133 | 102 |
| 50 | 117 | 107 | 100 | 76 |
| 75 | 96 | 81 | 85 | 65 |
| 100 | 84 | 67 | 75 | 57 |
| 125 | 75 | 58 | 69 | 52 |
| 150 | 69 | 51 | 64 | 48 |
| 175 | 64 | 46 | 60 | 45 |
| 200 | 60 | 42 | 57 | 43 |

## TABLE A-16

## RELATIONSHIP OF LABOR REQUIREMENTS TO SCALE OF ENTERPRISE*

| No. of Animal Units | Hours of Labor per Animal Unit<br>Prairie Region | Parkland Region | Grey-Wooded Region | Peace River Region |
|---|---|---|---|---|
| 25 | 18.3 | 21.6 | 33.1 | 31.3 |
| 50 | 12.3 | 14.5 | 18.0 | 21.6 |
| 75 | 9.7 | 11.5 | 12.6 | 17.4 |
| 100 | 8.3 | 9.7 | 9.8 | 14.9 |
| 125 | 7.3 | 8.6 | 8.1 | 13.2 |
| 150 | 6.5 | 7.7 | 6.9 | 12.0 |
| 175 | 6.0 | 7.1 | 6.0 | 11.0 |
| 200 | 5.5 | 6.6 | 5.4 | 10.3 |

* Derived by regression analysis

Because of a limited amount of information, particularly for the Peace River and the Parkland regions, the information in Tables A-15 and A-16 may not be entirely representative throughout the entire scale of enterprise.

## TABLE A-17

## AVERAGE RANGE OR PASTURE ACREAGE

| | Lands & Forests Leased Acreage | | Deeded, Other Pasture Acreage | |
|---|---|---|---|---|
| | Ac. | % of Total | Ac. | % of Total |
| Prairie Region | 2300 | 61 | 1464 | 39 |
| Parkland Region | 326 | 40 | 541 | 60 |
| Grey-Wooded Region | 628 | 65 | 334 | 35 |
| Peace River Region | 860 | 74 | 306 | 26 |

## TABLE A-18

## PASTURE ACREAGE IMPROVED, POSSIBLE TO IMPROVE

| | Percent Improved | | Percent of Native Possible to Improve | |
|---|---|---|---|---|
| | L & F Lease | Deeded, Other | L & F Lease | Deeded, Other |
| Prairie Region | 0.6 | 15.9 | 13.8 | 15.7 |
| Parkland Region | 6.2 | 13.4 | 31.6 | 27.9 |
| Grey-Wooded Region | 6.3 | 26.1 | 41.0 | 46.7 |
| Peace River Region | 4.3 | 36.2 | 27.8 | 46.0 |

## TABLE A-19

## A SUMMARY OF RETURNS AND COSTS PER A.U.*

| | Gross Return ($) | Total Prod'n Cost ($) | Net Return To Mg't ($) | Net Return to Labor & Mg't ($) |
|---|---|---|---|---|
| Prairie Region | 120.54 | 92.32 | 28.22 | 44.19 |
| Parkland Region | 114.83 | 117.22 | - 2.39 | 18.69 |
| Grey-Wooded Region | 107.70 | 120.46 | - 12.76 | 14.68 |
| Peace River Region | 107.66 | 137.54 | - 29.88 | 12.59 |

* Cow-calf enterprizes at median herd size.

TABLE A-13

[illegible] SUMMARY OF RETURNS AND COSTS PER ACRE

| | Gross Return (1) | Total Produc. Cost (3) | Net Return to Mgt. (4) | Net Return to Labor & Mgt. (5) |
|---|---|---|---|---|
| [illegible] Region [1] | [illegible] | 54.32 | 18.82 | 46.19 |
| [illegible] Region | [illegible] | 107.08 | - 2.30 | 18.82 |
| [illegible] Region | [illegible] | 105.46 | - 12.25 | 19.68 |
| [illegible] Region | [illegible] | 37.54 | - 20.50 | 12.28 |

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[1] [illegible] make also.